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(54) **ADAPTER TO ACTUATE A DELIVERY SYSTEM**

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A61F 2/962 (2013.01)
B23B 45/00 (2006.01)
A61F 2/95 (2013.01)

(52) **U.S. Cl.**

CPC ***A61F 2/2436*** (2013.01); ***A61F 2/962*** (2013.01); ***B23B 45/00*** (2013.01); *A61F 2002/9517* (2013.01)

(58) **Field of Classification Search**

CPC A61F 2002/9517; A61F 2/243; A61F 2/2436; A61F 2/95; A61F 2/962; A61F 2002/011; B23B 45/00

USPC 623/1.11, 1.12, 2.11; 606/191, 200

See application file for complete search history.

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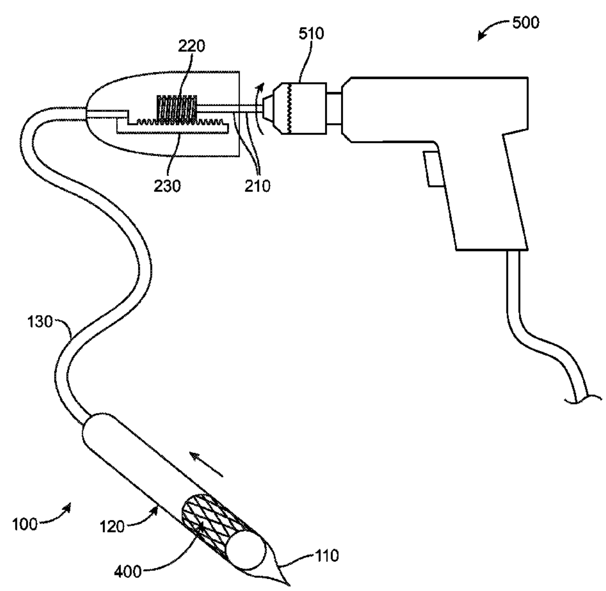
Primary Examiner — Katherine M Shi

(57) **ABSTRACT**

Apparatus for actuating a delivery system are disclosed. The apparatus may comprise an adapter. The adapter may comprise an input, a first actuator, and a second actuator. The adapter may be configured to receive a portion of a delivery system. The adapter may be configured to impart translational motion to the delivery system. The adapter may be configured to impart translational motion to a catheter. The adapter may be configured to be actuated by a motorized device or a drill. The adapter may be configured to actuate multiple delivery systems. The adapter may be configured to at least partially compress a portion of an article such as a prosthetic heart valve.

9 Claims, 8 Drawing Sheets



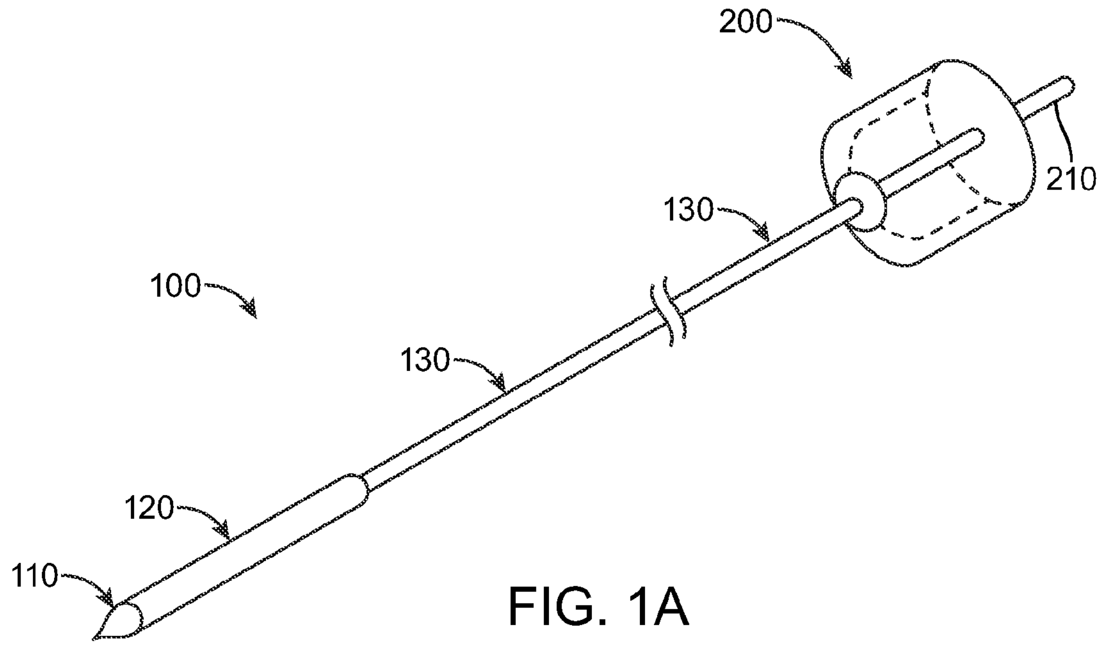


FIG. 1A

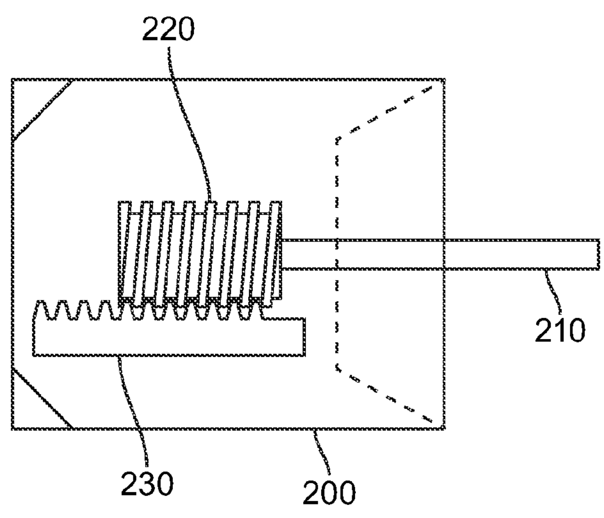


FIG. 1B

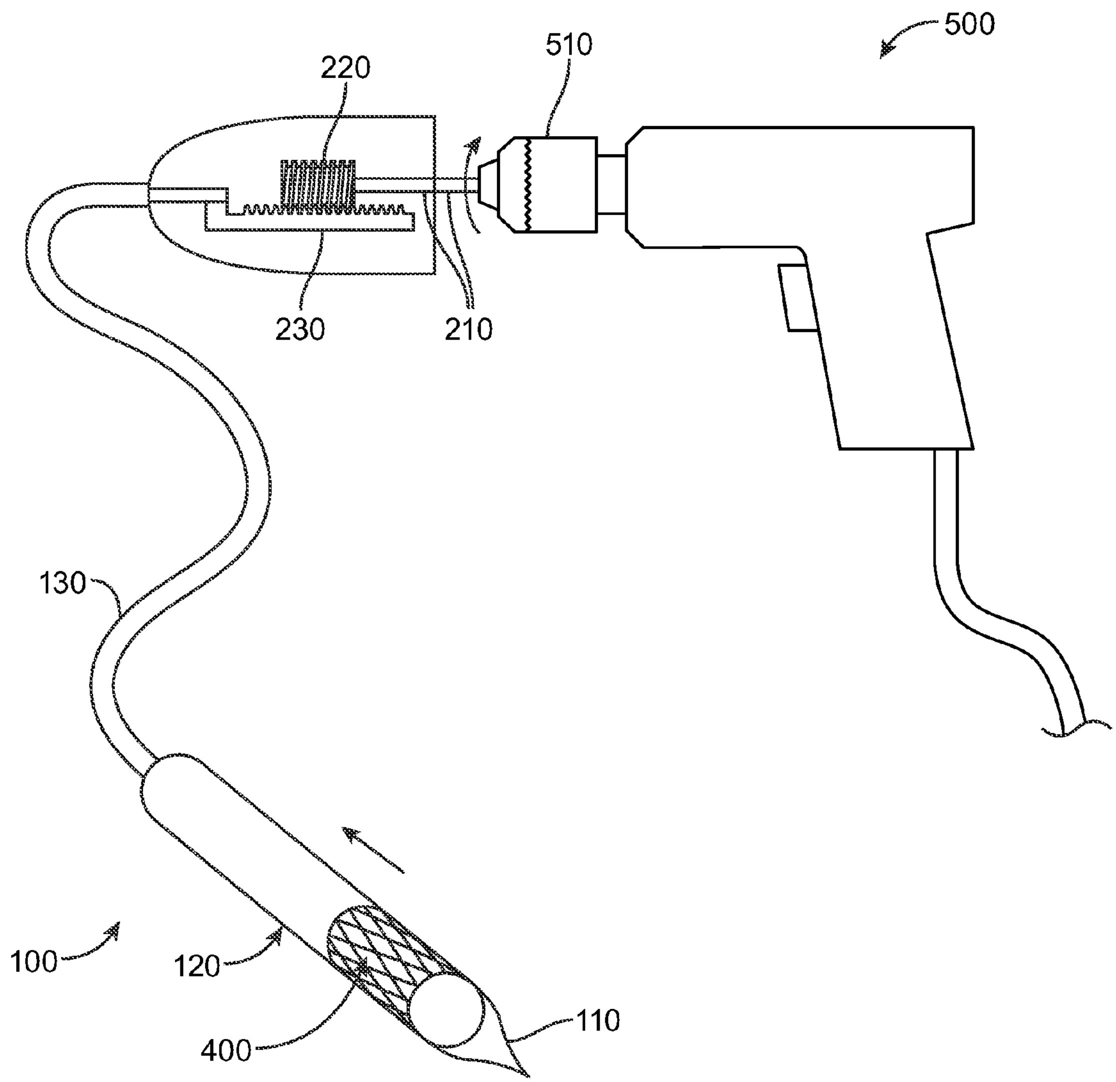


FIG. 2

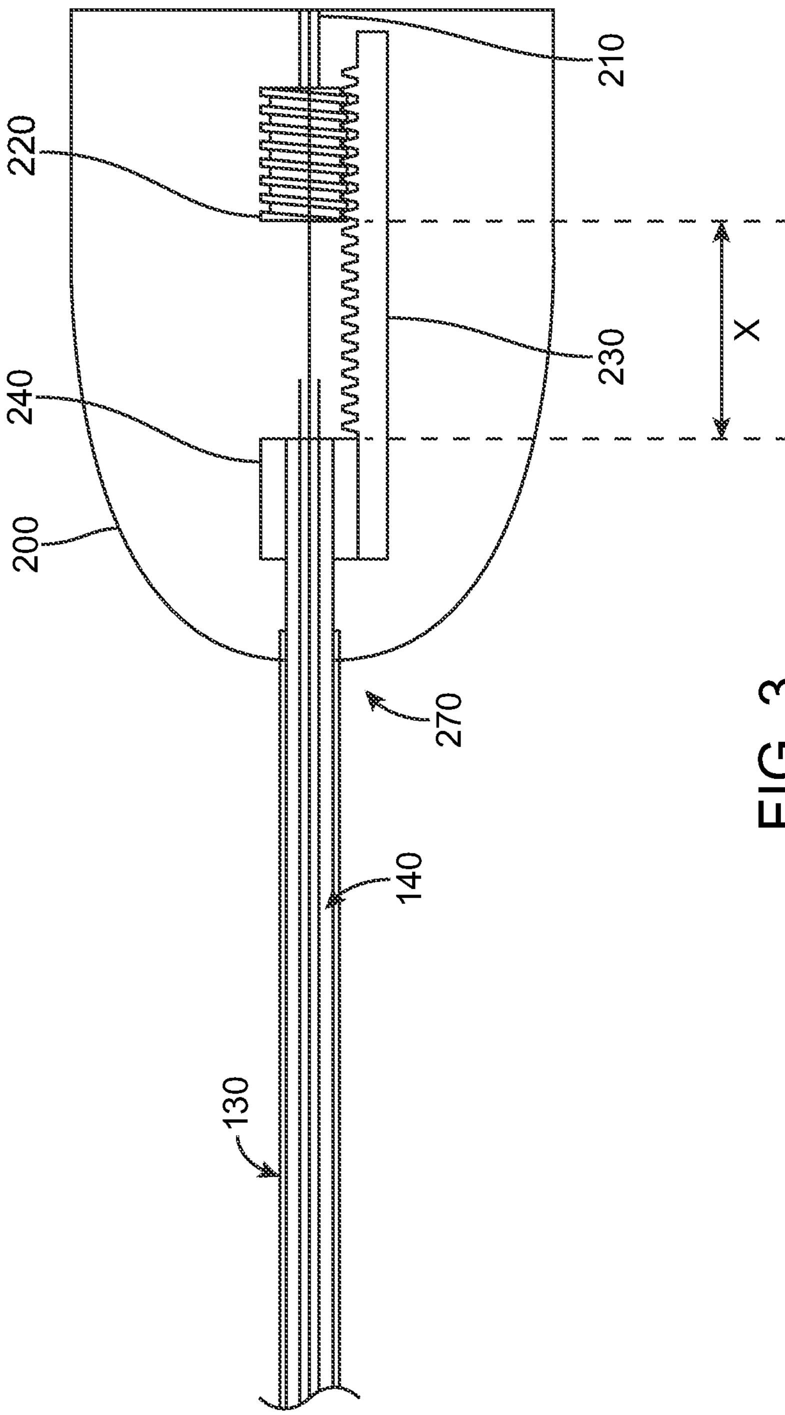


FIG. 3

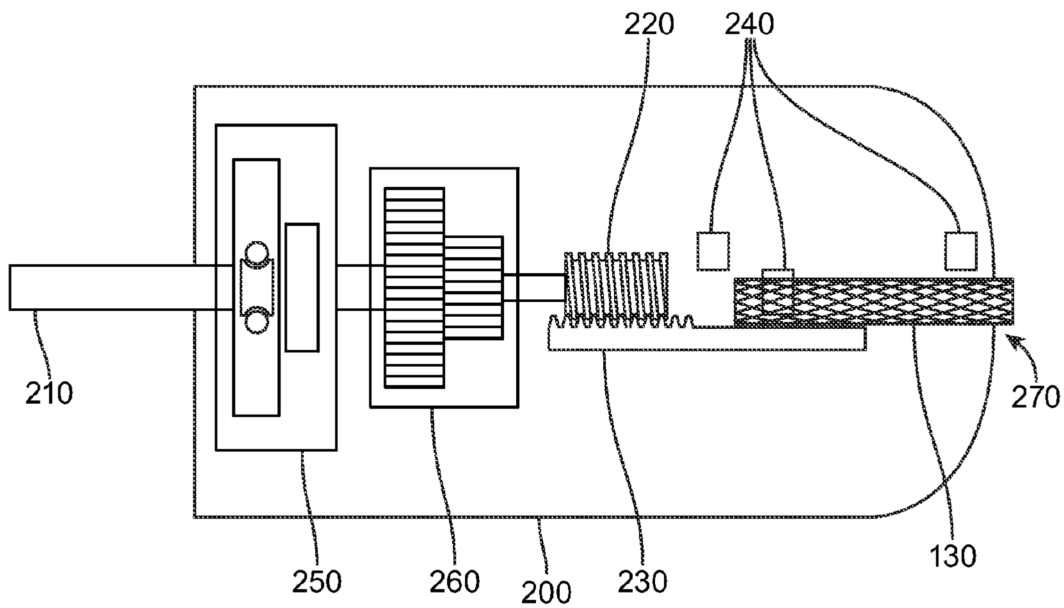


FIG. 4

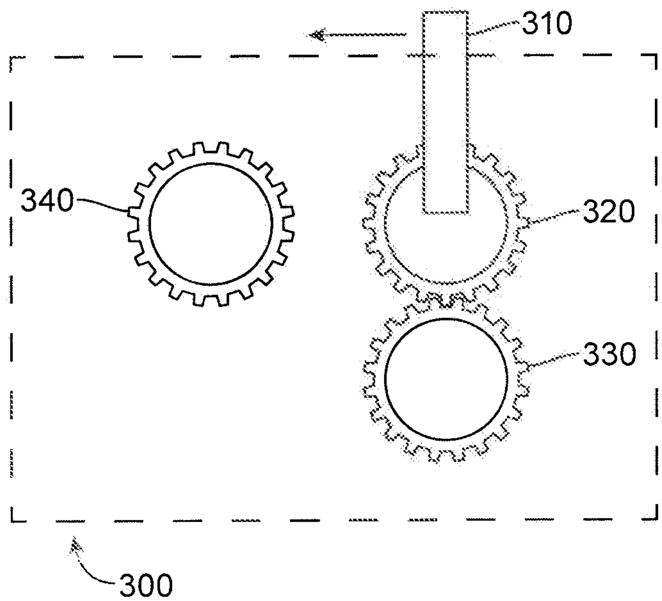


FIG. 5A

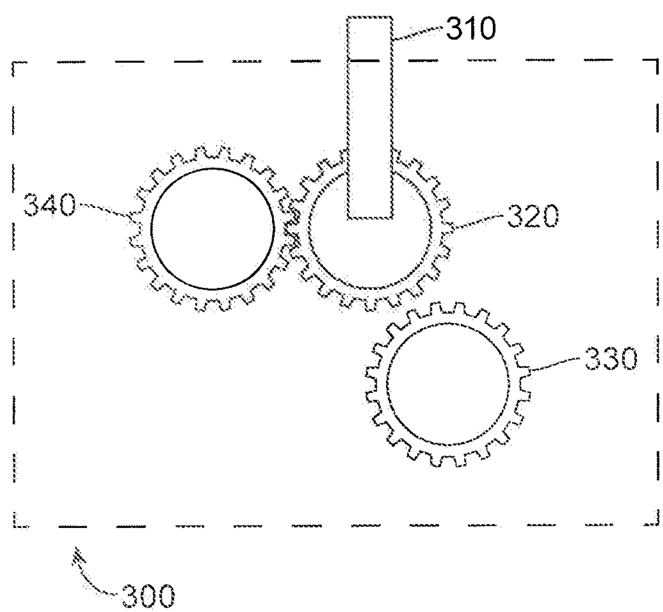


FIG. 5B

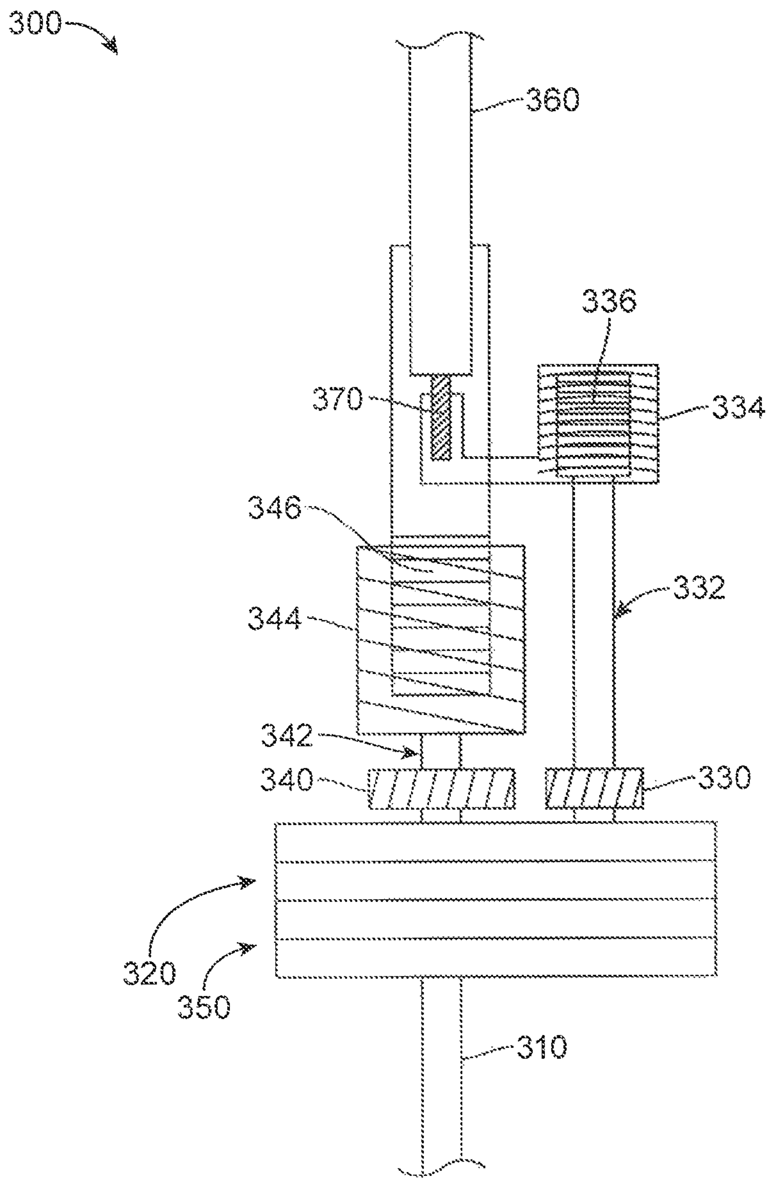


FIG. 6

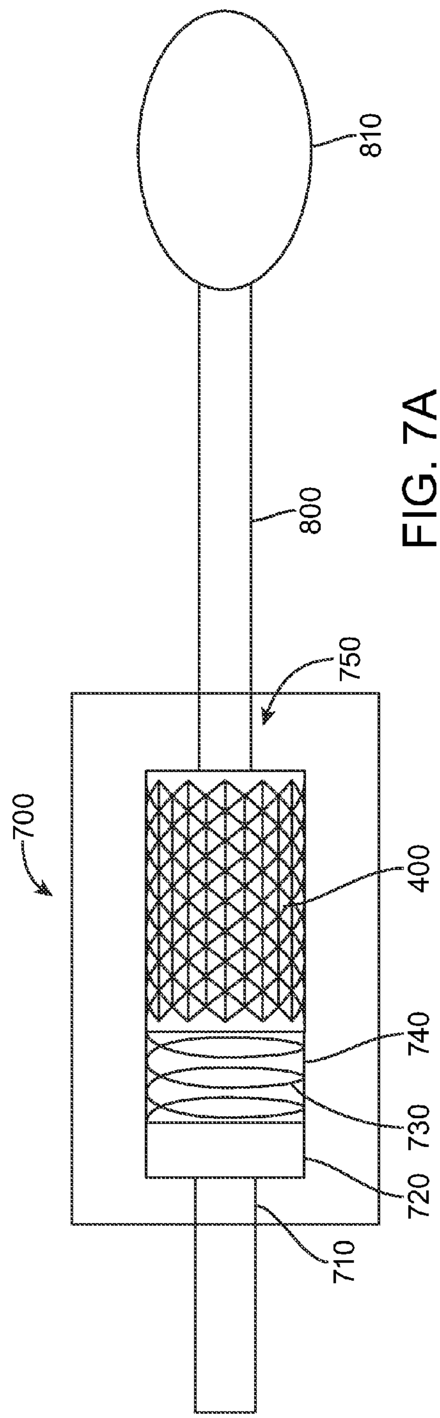

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FIG. 7A

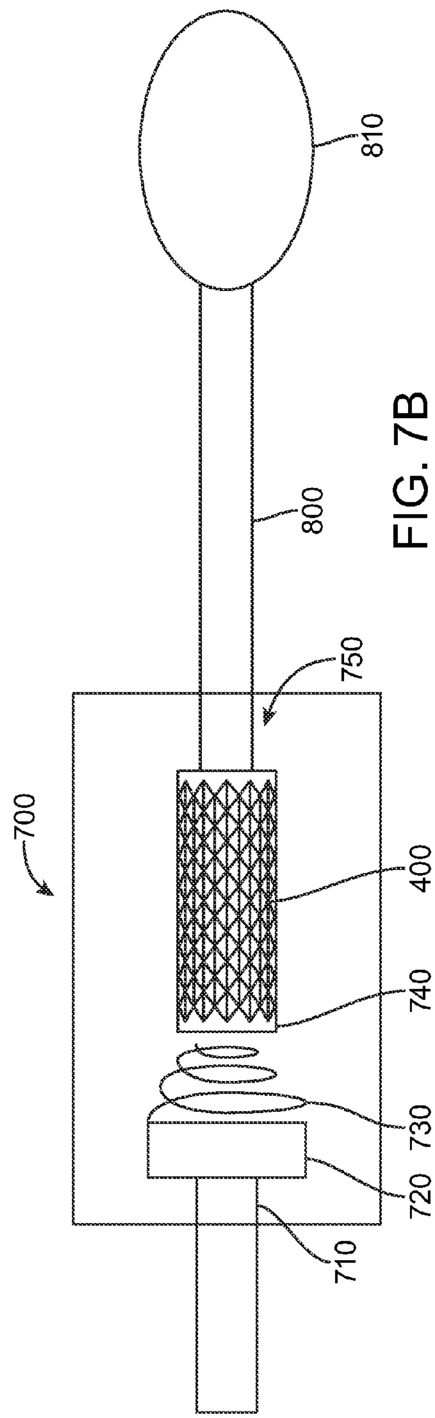
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FIG. 7B

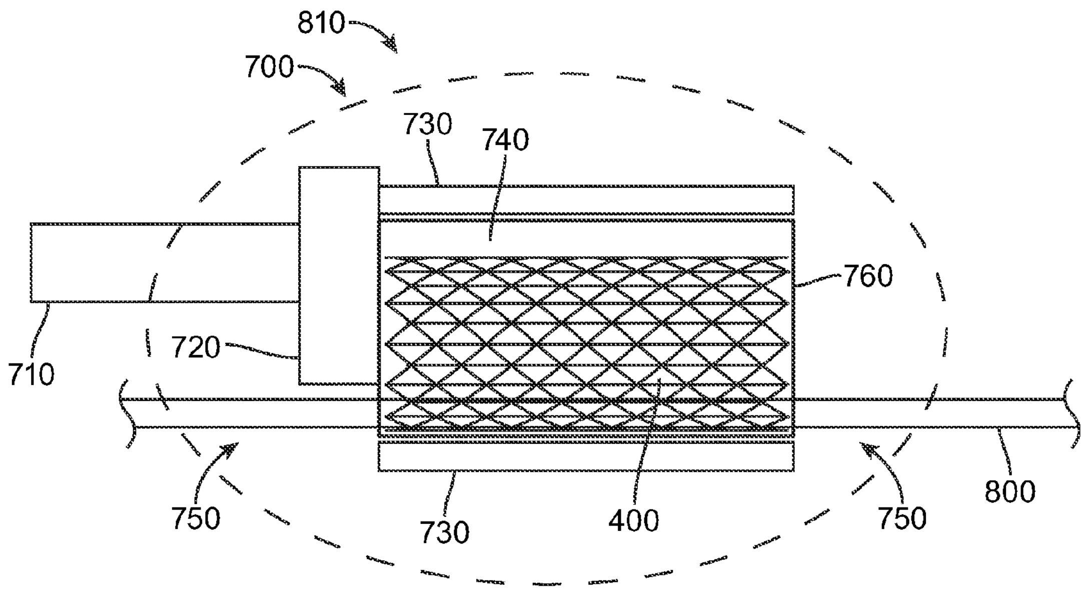
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FIG. 8A

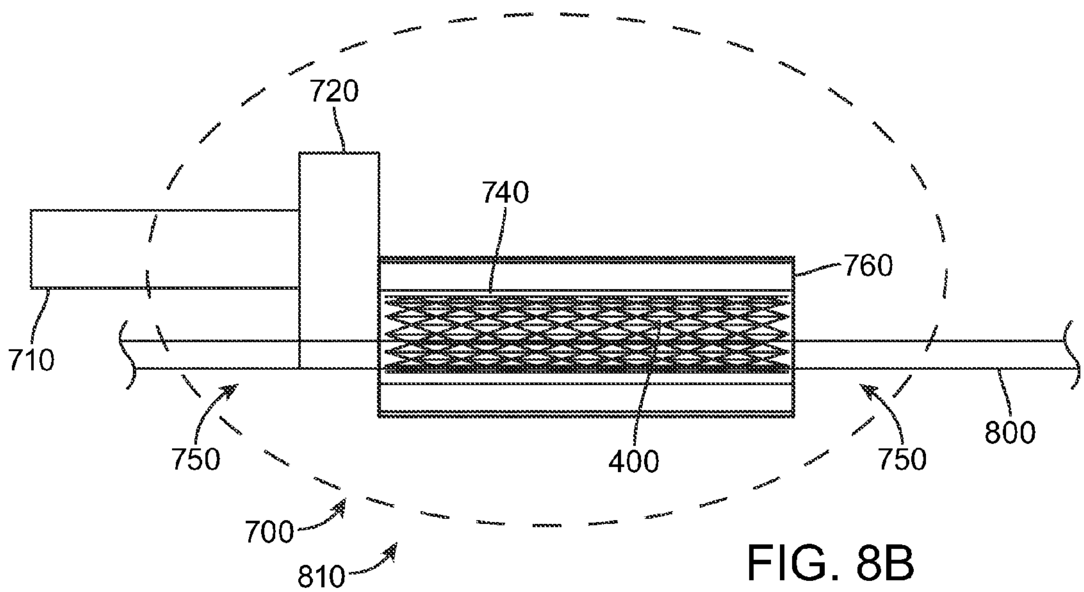
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FIG. 8B

ADAPTER TO ACTUATE A DELIVERY SYSTEM

BACKGROUND

Many procedures exist in which a prosthesis is loaded and deployed on a delivery system or by a delivery system. Some of these prostheses include transcatheter aortic valve implants (TAVI). In some procedures to deploy certain prostheses a physician implants the prosthesis. In some procedures a TAVI is deployed using an electromechanical system. However, such electromechanical systems can be complicated, costly, required disposal of certain parts, and may be subject to multiple health care rules or regulations or other rules and regulations. The drawbacks of using such electromechanical devices can prove costly, inconvenient, and discourage or prohibit physicians from using such systems. But electromechanical systems can provide advantages over non-electromechanical systems. Thus, there is a need to develop an electromechanical system that can load and deploy a prosthetic in such a way that the prosthetic and the system may comply with procedures, while also being safe, efficient, and cost effective.

BRIEF SUMMARY

In accordance with some embodiments an adapter is configured to actuate a delivery system. In some embodiments an adapter may comprise an input shaft, a first actuator, and a second actuator. In some embodiments adapter may comprise a stopper to prevent or limit motion of one or more actuators. In some embodiments an adapter may comprise a torque limiter. In some embodiments an adapter may comprise a gear box. In some embodiments an adapter may comprise opening. In some embodiments a first actuator and a second actuator comprises gears. In some embodiments a first actuator and a second actuator comprises an actuator other than a gear.

In some embodiments an adapter is configured to impart translational motion to a delivery system. In some embodiments an adapter is configured to impart translational motion to a catheter. In some embodiments an adapter is configured to impart translational motion to a portion of catheter, such as a tip.

In some embodiments an adapter is configured to be actuated by a drill device. In some embodiments an adapter is configured to be actuated by a motorized device. In some embodiments an adapter provides a way to utilize an electromechanical system without certain drawbacks associated with such a system.

In some embodiments an apparatus for actuating a delivery system is disclosed, the apparatus comprising an input shaft, a first actuator coupled to the input shaft, and a second actuator configured to be coupled to a first catheter-based delivery system. In some embodiments the first actuator is configured to actuate the second actuator such that a first portion of the first catheter-based delivery system is actuated.

In some embodiments translational motion of the second actuator results from a rotation of the first actuator.

In some embodiments the input shaft is configured to be actuated by a motorized drill.

In some embodiments the apparatus is configured to limit the amount of translational motion of the second actuator by a limit switch.

In some embodiments the apparatus further comprises a first catheter-based delivery system comprising a tip, a capsule adjacent the tip, and an inner sheath adjacent the capsule. In some embodiments the translational motion of the second actuator corresponds to translational motion of the tip of the first catheter-based delivery system.

In some embodiments the apparatus further comprises a torque limiter, wherein the torque limiter is configured to limit an output torque of the apparatus.

In some embodiments the apparatus further comprises a gear box.

In some embodiments the apparatus further comprises a third actuator configured to be coupled to the first catheter-based delivery system. In some embodiments the apparatus further comprises a selector. In some embodiments the first actuator is configured to actuate the third actuator such that a second portion of the first catheter-based delivery system is actuated. In some embodiments the first actuator is configured to actuate the second actuator and the third actuator. In some embodiments when the selector is actuated the first actuator actuates one of the second actuator and the third actuator.

Some embodiments provide a method of actuating a delivery system, the method comprising attaching an electrically-powered apparatus to a catheter-based delivery system, the apparatus comprising an input shaft, a first actuator attached to the input shaft, the first actuator configured to interact with a second actuator, the second actuator coupled to the catheter-based delivery system.

In some embodiments the method may further comprise actuating the input shaft via a power source. In some embodiments the method may further comprise actuating the catheter-based delivery system via the apparatus.

In some embodiments the power source comprises a drill. In some embodiments actuating the catheter-based delivery system comprises advancing the catheter-based delivery system via the actuators actuated by the drill. In some embodiments advancing the catheter-based delivery system further comprises imparting translational movement via the actuators.

In some embodiments the catheter-based delivery system further comprises a channel and a compressor and an article. In some embodiments the channel is configured to receive the article. In some embodiments actuating the catheter-based delivery system comprises compressing a portion of the article.

In some embodiments the catheter-based delivery system further comprises a catheter. In some embodiments the article comprises a heart valve. In some embodiments actuating the catheter-based delivery system comprises compressing the heart valve into a cylindrical shape. In some embodiments the heart valve is disposed on the catheter.

In some embodiments an assembly comprises a first actuator, a second actuator, and a channel. In some embodiments the first actuator is configured to be actuated by a motor. In some embodiments the channel is configured to receive a prosthesis. In some embodiments the channel is configured to compress a portion of the prosthesis via the second actuator. In some embodiments the channel is configured to receive a catheter-based delivery system.

In some embodiments the second actuator comprises a spring.

In some embodiments the second actuator comprises an arm.

In some embodiments the first actuator is configured to be actuated by a drill.

In some embodiments the channel is configured to receive a heart valve and a heart valve frame.

In some embodiments the apparatus further comprises a detachable portion.

In some embodiments the channel is further configured to compress the article into a cylinder via the second actuator.

In some embodiments the article is disposed on the catheter after being compressed into a cylinder.

The embodiments and related concepts will be more fully understood from the following detailed description of the embodiments thereof.

BRIEF DESCRIPTION OF THE FIGURES

FIGS. **1**A-**1**B illustrate an apparatus for actuating a delivery system in accordance with some embodiments;

FIGS. **2**-**4** illustrate apparatus for actuating a delivery system in accordance with some embodiments;

FIGS. **5**A-**5**B illustrate an apparatus for actuating a delivery system in accordance with some embodiments;

FIG. **6** illustrates an apparatus for actuating a delivery system in accordance with some embodiments;

FIGS. **7**A and **7**B illustrate an apparatus for actuating a delivery system in accordance with some embodiments; and

FIGS. **8**A and **8**B illustrate an apparatus for actuating a delivery system in accordance with some embodiments.

DETAILED DESCRIPTION OF EMBODIMENTS

While the disclosure refers to illustrative embodiments for particular embodiments, it should be understood that the disclosure is not limited thereto. Modifications can be made to the embodiments described herein without departing from the spirit and scope of the present disclosure. Those skilled in the art with access to this disclosure will recognize additional modifications, embodiments, and embodiments within the scope of this disclosure and additional fields, in which the disclosed examples could be applied. Therefore, the following detailed description is not meant to be limiting. Further, it is understood that the apparatus and methods described below can be implemented in many different embodiments of hardware. Any actual hardware described is not meant to be limiting. The operation and behavior of the apparatus and methods presented are described with the understanding that modifications and variations of the embodiments are possible.

References to "one embodiment," "an embodiment," "some embodiments," "in certain embodiments," etc. . . . , indicate that the embodiment described may include a particular feature, structure, or characteristic, but every embodiment may not necessarily include the particular feature, structure, or characteristic. Moreover, such phrases are not necessarily referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with an embodiment, it is submitted that it is within the knowledge of one skilled in the art to affect such feature, structure, or characteristic in connection with other embodiments whether or not explicitly described.

In some embodiments an electromechanical adapter or apparatus is disclosed. In some embodiments an adapter helps simplify the mechanical system associated with using an electromechanical system to load or deploy a prosthesis. This adapter may be configured to help control forces required for such loading and deploying of a prosthesis. In some embodiments this adapter is configured to apply an appropriate amount of force or torque such that a prosthesis can be loaded or deployed. The adapter may provide a convenient delivery device to be used as part of an electromechanical system. In some embodiments the adapter is configured to be used with other tools sometimes found in a hospital, operating room, or other area in which a patient is undergoing treatment.

In some embodiments, as shown in FIGS. **1**-**4**, adapter **200** is configured to actuate a delivery system. In some embodiments adapter **200** is configured to actuate a catheter-based delivery system. In some embodiments adapter **200** comprises input shaft **210**. In some embodiments adapter **200** comprises a first actuator **220** and a second actuator **230**. In some embodiments adapter **200** comprises a stopper **240**. In some embodiments adapter **200** comprises a torque limiter **250**. In some embodiments adapter **200** comprises a gearbox **260**. In some embodiments adapter **200** comprises an opening **270**.

In some embodiments, as shown in FIG. **1**B, adapter **200** comprises input shaft **210** and a first actuator **220**. This first actuator **220** may be coupled to the input shaft **210**. In some embodiments the adapter comprises a first actuator **220** and a second actuator **230**. In some embodiments the second actuator **230** is configured to be coupled to a first catheter-based delivery system.

In some embodiments, as shown in FIGS. **1**-**3**, a first catheter-based delivery system may comprise catheter **100**. In some embodiments catheter **100** may comprise tip **110**, capsule **120**, outer sheath **130**, and inner sheath **140**. In some embodiments first actuator **220** is configured to actuate or drive second actuator **230**. In some embodiments when first actuator **220** actuates second actuator **230** the adapter **200** is configured to actuate a portion of a delivery system. In some embodiments when first actuator **220** actuates second actuator **230** the adapter **200** is configured to actuate a portion of catheter **100**. In some embodiments when first actuator **220** actuates second actuator **230**, the adapter **200** is configured to actuate tip **110**.

In some embodiments, as shown in FIG. **2**, second actuator **230** is configured to move linearly after being actuated. In some embodiments second actuator **230** is configured for translational motion. In some embodiments first actuator **220** is configured to rotate. In some embodiments the rotational motion of first actuator **220** produces translational motion of second actuator **230**. In some embodiments input shaft **210** of adapter **200** is configured to be coupled to an additional mechanism. The input shaft **210** may be configured to be actuated by a motor. The input shaft **210** may be configured to be actuated by a drill **500**. The input shaft **210** may be configured to be actuated by a motorized drill **500**.

In some embodiments, as shown in FIG. **3**, the adapter **200** is configured to limit the amount of translational motion of second actuator **230** by a stopper **240**. In some embodiments stopper **240** is a limit switch. In some embodiments stopper **240** prevents motion. In some embodiments stopper **240** limits motion.

In some embodiments adapter **200** is separate from a delivery system and a motorized device. In some embodiments adapter **200** is an isolated assembly or apparatus. In some embodiments adapter **200** is coupled to a delivery system. In some embodiments adapter **200** may be coupled to catheter **100**. In some embodiments adapter **200** may be connected to catheter **100**. In some embodiments adapter **200** comprises catheter **100**.

In some embodiments, as shown in FIGS. **1**-**3**, catheter **100** comprises a tip **110**, a capsule **120**, and an inner sheath **140**. In some embodiments tip **110** is adjacent to capsule **120**. In some embodiments capsule **120** is adjacent to inner sheath **140**. In some embodiments adapter **200** comprises input shaft **210**, first actuator **220**, second actuator **230**, and stopper **240**. The second actuator **230** may be configured for translational motion. In some embodiments second actuator **230** is configured to provide translational motion to a portion of catheter **100**. In some embodiments catheter **100** is configured to be translated or moved by another element of the system, such as second actuator **230**. The translational motion of second actuator **230** may correspond to translational motion of tip **110**.

In some embodiments, as shown in FIG. **4**, adapter **200** comprises a torque limiter **250**. In some embodiments torque limiter **250** is configured to limit output torque of adapter **200**. In some embodiments adapter **200** comprises a gearbox **260**. In some embodiments gear box **260** is configured to transmit energy from one element of adapter **200** to another element of adapter **200**. The gearbox **260** may be configured to increase the torque and reduce the speed of some elements of adapter **200**. The gearbox **260** may decrease the torque and increase the speed of some elements of adapter **200**. The gear box **260** may help change the operating speed of adapter **200** relative to the operating speed of input shaft **210**.

Some embodiments disclose a method of actuating a delivery system using an electrically powered apparatus. In some embodiments this method includes attaching an apparatus to a delivery system. In some embodiments this method includes attaching adapter **200** to catheter **100**. In some embodiments an electrically powered apparatus is attached to a catheter-based delivery system. In some embodiments a catheter-based delivery system comprises catheter **100**. In some embodiments the apparatus comprises an adapter **200**. In some embodiments adapter **200** comprises an input shaft **210** and a first actuator **220** attached to input shaft **210**. In some embodiments first actuator **220** is configured to interact with a second actuator **230**. In some embodiments second actuator **230** is coupled to a catheter-based delivery system. In some embodiments second actuator is coupled to catheter **100**.

In some embodiments the method comprises actuating an input shaft **210** via a power source. In some embodiments the method comprises actuating the catheter-based delivery system via the adapter **200**. In some embodiments the method comprises actuating the catheter **100** via the adapter **200**.

In some embodiments a power source comprises a drill **500**. In some embodiments a power source comprises a motorized drill **500**. In some embodiments actuating a catheter **100** comprises advancing the catheter **100** via the first actuator **220** and second actuator **230** by the drill **500**. In some embodiments advancing catheter **100** comprises imparting translational movement to catheter **100** via one or both of first actuator **220** and second actuator **230**.

In some embodiments an apparatus comprises adapter **200**. In some embodiments an apparatus comprises adapter **200** and catheter **100**. In some embodiments adapter **200** comprises an input shaft **210**, first actuator **220**, and second actuator **230**.

In some embodiments catheter **100** comprises tip **110**, capsule **120**, and inner sheath **140**. In some embodiments tip **110** is adjacent capsule **120**. In some embodiments capsule **120** is adjacent to inner sheath **140**. In some embodiments adapter **200** is configured to receive inner sheath **140**. In some embodiments adapter **200** is configured to receive inner sheath **140** via opening **270**.

The catheter **100** may be configured to be coupled to adapter **200**. The catheter **100** may be configured to be attached to adapter **200**. The catheter **100** may also be configured to be joined to adapter **200**. The catheter **100** may be configured to be connected to adapter **200**.

In some embodiments catheter **100** may be configured to contain a medical device. The catheter **100** may be configured to contain a prosthetic heart valve **400**. In some embodiments catheter **100** may be configured to have a medical device disposed on catheter **100**. The catheter **100** may be configured to have a prosthetic heart valve **400** disposed on catheter **100**. In some embodiments catheter **100** may be configured to have a medical device disposed in catheter **100**. The catheter **100** may be configured to have a prosthetic heart valve **400** disposed in catheter **100**.

In some embodiments capsule **120** may be configured to contain a prosthetic heart valve **400**. In some embodiments capsule **120** may be configured to have a medical device disposed on capsule **120**. In some embodiments capsule **120** may be configured to have a prosthetic heart valve **400** disposed on capsule **120**.

In some embodiments adapter **200** is configured to actuate catheter **100**. In some embodiments adapter **200** is configured to impart translational motion to catheter **100**. In some embodiments adapter **200** is configured to produce translational motion of inner sheath **140**. In some embodiments adapter **200** is configured to produce translational motion of outer sheath **130**. In some embodiments adapter **200** is configured to produce translational motion of capsule **120**. In some embodiments adapter **200** is configured to produce translational motion of tip **110**.

Adapter **200** may be configured to impart translational motion to catheter **100** via a first actuator **220**. In some embodiments adapter **200** is configured to impart translational motion to catheter **100** via a first actuator **220** and a second actuator **230**. In some embodiments adapter **200** is configured to impart translational motion to catheter **100** via a second actuator **230**. In some embodiments adapter **200** is configured to impart translational motion to a portion of catheter **100** or via a drill **500**. In some embodiments adapter **200** is configured to impart translational motion to a portion of catheter **100** or via a surgical drill **500**. In some embodiments adapter **200** is configured to impart translational motion to a portion of catheter **100** or via a drill **500** with a chuck mechanism.

Adapter **200** may comprise an input shaft **210**. In some embodiments adapter **200** comprises first actuator **220**. In some embodiments adapter **200** comprises second actuator **230**. In some embodiments first actuator **220** may comprise a gear. In some embodiments first actuator **220** may comprise an actuator different from a gear. In some embodiments second actuator **230** may comprise a gear. In some embodiments second actuator **230** may comprise an actuator different from a gear.

In some embodiments first actuator and second actuator **230** are configured to contact one another. In some embodiments first actuator **220** may comprise a rotational gear. In some embodiments first actuator **220** may comprise a pinion gear. In some embodiments second actuator **230** may comprise a rack gear. In some embodiments the rotational motion of first actuator **220** may create rotate translational motion of second actuator **230**. In some embodiments first actuator **220** is configured to be rotated clockwise or counterclockwise or both. In some embodiments second actuator **230** is configured to translate away from first actuator **220**. In some embodiments second actuator **230** is configured to translate toward first actuator **220**.

A motorized device **600** or drill **500** may be coupled to the input shaft **210**. In some embodiments a motorized device **600** or drill **500** may be connected to the input shaft **210**. In some embodiments a motorized device **600** or drill **500** may be joined to the input shaft **210**.

In some embodiments second actuator **230** is configured to translate toward motorized device **600** or drill **500**. In some embodiments second actuator **230** is configured to translate toward motorized device **600** or drill **500** when motorized device **600** or drill **500** is connected to input shaft **210**. In some embodiments second actuator **230** is configured to translate toward motorized device **600** or drill **500**. In some embodiments second actuator **230** is configured to translate away from motorized device **600** or drill **500** when motorized device **600** or drill **500** is connected to input shaft **210**.

The first actuator **220** may be configured to be a worm gear. In some embodiments second actuator **230** is configured to be a worm gear. In some embodiments any actuator may comprise a gear, an auger, a lever, an arm, or any other suitable device known to a person of ordinary skill in the art.

Catheter **100** may include tip **110**, capsule **120**, inner sheath **140**, and outer sheath **130**. In some embodiments tip **110** may comprise varying cross-sections. In some embodiments tip **110** may taper to a point. In some embodiments tip **110** will increase in cross-sectional area. In some embodiments tip **110** may be a blunt tip. In some embodiments tip **110** may be adjacent to capsule **120**. In some embodiments tip **110** made taper from a smaller cross-sectional area to a larger cross-sectional area directly adjacent capsule **120**.

In some embodiments capsule **120** is configured to contain a prosthetic heart valve **400**. In some embodiments capsule **120** is configured to have a prosthetic heart valve **400** disposed on capsule **120**. In some embodiments prosthetic heart valve **400** may be longer than capsule **120**. In some embodiments prosthetic heart valve **400** may be longer than capsule **120**. In some embodiments inner sheath **140** may be longer than capsule **120**. In some embodiments inner sheath **140** may be shorter than capsule **120**. In some embodiments capsule **120** may be longer than tip **110**. In some embodiments capsule **120** may be shorter than tip **110**.

The inner sheath **140** may be fed directly into adapter **200**. In some embodiments adapter **200** is configured to couple inner sheath **140** within adapter **200**. In some embodiments adapter **200** is configured to hold inner sheath **140** in a fixed position. In some embodiments adapter **200** is configured to receive inner sheath **140**. In some embodiments adapter **200** is configured to couple inner sheath **140** with an element of adapter **200**. In some embodiments adapter **200** is configured to connect inner sheath **140** with an element of adapter **200**. In some embodiments adapter **200** is configured to attach inner sheath **140** with an element of adapter **200**. In some embodiments adapter **200** is configured to receive inner sheath **140** such that inner sheath **140** is connected to first actuator **220**. In some embodiments adapter **200** is configured to receive inner sheath **140** such that inner sheath **140** is connected to second actuator **230**.

In some embodiments outer sheath **130** may be fed directly into adapter **200**. In some embodiments adapter **200** is configured to couple outer sheath **130** with adapter **200**. In some embodiments adapter **200** is configured to hold outer sheath **130** in a fixed position. In some embodiments adapter **200** is configured to receive outer sheath **130**. In some embodiments adapter **200** is configured to couple outer sheath **130** with an element of adapter **200**. In some embodiments adapter **200** is configured to connect inner outer sheath **130** with an element of adapter **200**. In some embodiments adapter **200** is configured to attach outer sheath **130** with an element of adapter **200**. In some embodiments adapter **200** is configured to receive outer sheath **130** such that in outer sheath **130** is connected to first actuator **220**. In some embodiments adapter **200** is configured to receive outer sheath **130** such that outer sheath **130** is connected to second actuator **230**.

In some embodiments adapter **200** is configured to translate rotational motion of first actuator **220** into translational motion is second actuator **230**. In some embodiments this translational motion may be linear motion. In some embodiments adapter **200** is configured to use stopper **240** to limit translational motion of second actuator **230**. In some embodiments adapter **200** is configured to use stopper **240** to limit translational motion of catheter **100**.

In some embodiments adapter **200** comprises multiple stoppers **240**. In some embodiments a stopper **240** prevents translational motion or limits translational motion in one direction. In some embodiments a second stopper **240** limits translational motion in another direction.

In some embodiments actuator **200** may contain at least a portion of catheter **100**. In some embodiments actuator **200** may encompass at least a portion of catheter **100**. In some embodiments actuator **200** may cover at least a portion of catheter **100**.

The actuator **200** may contain at least a portion of inner sheath **140**. The actuator **200** may encompass at least a portion of inner sheath **140**. The actuator **200** may cover at least a portion of inner sheath **140**.

The actuator **200** may contain at least a portion of outer sheath **130**. The actuator **200** may encompass at least a portion of outer sheath **130**. The actuator **200** may cover at least a portion of outer sheath. The actuator **200** may contain at least a portion of input shaft **210**. The actuator **200** may encompass at least a portion of **210**. In some embodiments actuator **200** may cover at least a portion of **210**.

The adapter **200** may comprise supports to hold portions of elements contained within adapter **200**.

The adapter **200** may be configured to receive a protrusion extending from a motorized device **600**. In some embodiments adapter **200** is configured to receive a protrusion extending from a drill **500**. In some embodiments adapter **200** is configured to receive a protrusion extending from a chuck **510** of drill **500**.

In some embodiments drill **500** may be a wireless device. In some embodiments drill **500** may be a battery operated device. In some embodiments drill **500** may be configured to plug into a power source. In some embodiments drill **500** may include a power source.

In some embodiments adapter **200** may comprise a torque limiter. In some embodiments torque limiter **250** will prevent drill **500** or motorized device **600** from over-torqueing the adapter **200** or a portion of the delivery system. In some embodiments torque limiter **250** will prevent over-torqueing when using drill **500** or motorized device **600** in conjunction with adapter **200**.

The sterilizable power source may be used in conjunction with adapter **200**. In some embodiments this sterilizable power source may be a drill **500**. In some embodiments this sterilizable power source may be a motorized device **600**. This prevents the need for physicians, hospitals, or other parties to replace power sources used during a procedure. This provides a cost-effective way to use an electromechanical system for procedures requiring a delivery system. This provides a cost-effective way to use an electromechanical system for procedures requiring a catheter **100**.

In some embodiments catheter **100** includes an inner sheath **140** and an outer sheath **130**. In some embodiments catheter **100** may only include one sheath. Descriptions of an inner sheath **140** or an outer sheath **130** should not be understood to be limiting. Any reference to an inner sheath **140** may be taken as a reference to outer sheath **130** unless contradictory. Any reference to an outer sheath **130** may be taken as a reference to inner sheath **140** unless contradictory.

As illustrated in FIG. **3**, adapter **200** may comprise an input shaft **210**, a first actuator **220**, and a second actuator **230**. In some embodiments adapter **200** may comprise a stopper **240**. In some embodiments adapter **200** may include opening **270**. In some embodiments opening **270** is configured to receive at least one sheath of catheter **100**. In some embodiments opening **270** is configured to receive inner sheath **140**. In some embodiments opening **270** is configured to receive outer sheath **130**. In some embodiments opening **270** is configured to receive outer sheath **130** and inner sheath **140**.

In some embodiments adapter **200** is configured to be coupled to inner sheath **140**. In some embodiments adapter **200** is configured to be coupled to outer sheath **130**. In some embodiments adapter **200** is configured to hold catheter **100** in place. In some embodiments a stopper **240** is attached to a second actuator **230**. In some embodiments stopper **240** is configured to be coupled to second actuator **230**. In some embodiments stopper **240** is stationary. In some embodiments stopper **240** is immovable. In some embodiments stopper **240** is configured to move. Stopper **240** may be configured to be stationary to limit the translational movement of some element or elements of adapter **200**. This stopper **240** may prevent movement in any direction. For example, stopper **240** may limit or prevent the translational motion of second actuator **230**. Stopper **240** may also be configured to move. Stopper **240** may be configured to move if a certain amount of force is applied. Stopper **240** may also be adjustable, such that for different operations of adapter **200**, stopper **240** may be moved to provide different limits on the motion of the elements of adapter **200**.

The stopper **240** may be configured to limit or prevent movement of first actuator **220**. In some embodiments stopper **240** is configured to limit or prevent movement of second actuator **230**. In some embodiments adapter **200** may be comprised of multiple embodiments. In some embodiments inner sheath **140** is configured to be disposed partially in adapter **200**. In some embodiments outer sheath **130** is configured to be disposed partially in adapter **200**.

In some embodiments adapter **200** is configured to receive one or both of inner sheath **140** and outer sheath **130**. In some embodiments one of inner sheath **140** and outer sheath **130** can be contained in adapter **200**. As illustrated in FIG. **3**, inner sheath **140** is configured to be advanced farther into adapter **200** than outer sheath **130**. In some embodiments first actuator **220** may comprise a gear. In some embodiments first actuator **220** may comprise an auger. In some embodiments first actuator **220** may comprise an actuator other than a gear.

The first actuator **220** may be configured to rotate clockwise. In some embodiments first actuator **220** may be configured to rotate counterclockwise. In some embodiments second actuator **230** may be configured to rotate. In some embodiments second actuator **230** may be configured for translation motion. This translation motion may be linear motion. In some embodiments second actuator **230** may be configured to translate a distance X. In some embodiments second actuator **230** is configured to travel a distance X where the distance X comprises a distance from one edge of a first actuator **222** to one edge of a stopper **240**. In some embodiments second actuator **230** is configured to travel a distance different from distance X. In some embodiments the distance X may comprise a distance greater than the length of first actuator **220**. In some embodiments the distance X may comprise a distance shorter than the length of first actuator **220**. In some embodiments the distance or length X may be greater than the length of stopper **240**. In some embodiments the distance or length X may be less than the length of stopper **240**.

The first actuator **220** may be configured to be actuated by motorized device **600**. In some embodiments first actuator **220** is configured to be actuated by drill **500**. In some embodiments first actuator **220** is configured to be rotated by motorized device **600**. In some embodiments first actuator **220** is configured to be rotated by drill **500**. In some embodiments adapter **200** is configured to cover or enclose first actuator **220**, second actuator **230**, and stopper **240**. In some embodiments adapter **200** is configured to contain first actuator **220**, second actuator **230**, and stopper **240**.

In some embodiments adapter **200** is configured to at least partially contain catheter **100**. In some embodiments adapter **200** is configured to at least partially contain inner sheath **140**. In some embodiments adapter **200** is configured to at least partially contain outer sheath **130**.

In some embodiments adapter **200** is configured to taper from a general cylinder shape to opening **270**. In some embodiments a portion of adapter **200** housing comprises an arc. In some embodiments a portion of adapter **200** housing comprises a substantially straight section.

The width of adapter **200** may be greater than the width of catheter **100**. In some embodiments the diameter of adapter **200** is greater than the diameter of catheter **100**. In some embodiments the circumference of adapter **200** is greater than the circumference of catheter **100**. In some embodiments the perimeter of adapter **200** is greater than the width of catheter **100**.

Adapter **200** may comprise a rectangular shape. In some embodiments adapter **200** may comprise a square shape. In some embodiments adapter **200** may comprise a circular shape. In other embodiments adapter **200** may comprise another shape.

In some embodiments adapter **200** may comprise indentations on its exterior. In some embodiments adapter **200** may comprise a grip portion on its exterior.

In some embodiments adapter **200** may comprise an input shaft **210**, a torque limiter **250**, a gearbox **260**, a first actuator **220**, a second actuator **230**, or a stopper **240**. In some embodiments input shaft **210** extends out from adapter to **200**. In some embodiments input shaft **210** is configured to be received by a drill **500**. In some embodiments input shaft **210** is configured to be received by a motorized device **600**.

In some embodiments input shaft **210** may have two ends. In some embodiments a first end of input shaft **210** is configured to be received by a drill **500** or a motorized device **600**. In some embodiments a second end of input shaft **210** is configured to be attached to a first actuator **220**. In some embodiments a second end of input shaft **210** is configured to be attached to a second actuator **230**.

The input shaft **210** may comprise a first actuator **220** disposed on one end. In some embodiments gearbox **260** is disposed on input shaft **210**. In some embodiments gearbox **260** is adjacent to first actuator **220**. In some embodiments gearbox **260** is proximate to first actuator **220**. In some embodiments input shaft **210** has multiple elements disposed on the shaft. In some embodiments first actuator **220**, gearbox **260**, and torque limiter **250** are all disposed on input shaft **210**. In some embodiments first actuator **220** may be adjacent to gearbox **260**. In some embodiments gearbox **260** may be adjacent torque limiter **250**. In some embodiments torque limiter **250** may be adjacent to a portion of input shaft **210** configured to be received by drill **500** or motorized device **600**. In some embodiments torque limiter **250** is configured to be adjacent to first actuator **220**. In some embodiments gearbox **260** is configured to be adjacent to a portion of input shaft **210** configured to be received by a drill **500** or motorized device **600**.

In some embodiments drill **500** is configured to rotate in a variable manner. In some embodiments gearbox **260** may prevent over-rotation of elements of adapter **200**. In some embodiments gearbox **260** may prevent over-rotation of first actuator **220**.

In some embodiments torque limiter **250** will prevent damage to elements of adapter **200**. In some embodiments torque limiter **250** will prevent damage first actuator **220**. In some embodiments torque limiter **250** will prevent damage to second actuator **230**.

In some embodiments torque limiter **250** may be of any type. In some embodiments torque limiter **250** may be a shear pin type, a synchronous magnetic type, a ball detent type, a pawl and spring type, a friction plate type, a magnetic particle type, or a magnetic hysteresis type, or any other type.

The gearbox **260** may be any type of gearbox.

Adapter **200** may be configured to be used with multiple catheters **100**. Adapter **200** may be configured to be used with multiple types of prosthetic heart valves **400**. In some embodiments prosthetic heart valve **400** is a transcatheter heart valve. In some embodiments prosthetic heart valve **400** is a self-expandable heart valve. In some embodiments prosthetic heart valve **400** is a balloon-expandable heart valve. In some embodiments prosthetic heart valve **400** is a mechanically-expandable heart valve.

In some embodiments adapter **200** is configured to produce translational motion. In some embodiments adapter **200** is configured to rotate first actuator **220** at a variable speed. In some embodiments adapter **200** can be configured to rotate faster or slower as needed to move second actuator **230**. In some embodiments adapter **200** can be configured to rotate faster or slower as needed to move catheter **100**.

For example, in some embodiments adapter **200** may be configured to rotate at one speed for deployment of an aortic prosthetic heart valve **400**. In some embodiments adapter **200** may be configured to rotate at one speed for deployment of a mitral prosthetic heart valve **400**.

The adapter **200** may comprise mechanical or electrical limit switches. In some embodiments stoppers **240** may comprise mechanical limit switches. In some embodiments stoppers **240** may comprise electrical limit switches. In some embodiments other elements of adapter **200** may comprise mechanical or electrical limit switches.

The second actuator **230** may comprises a rack gear. In some embodiments second actuator **230** is threaded along a portion of its length. In some embodiments second actuator **230** is threaded along its entire length.

In some embodiments second actuator **230** is attached to catheter **100**. In some embodiments second actuator **230** is attached to outer sheath **130**. In some embodiments second actuator **230** is attached to inner sheath **140**. In some embodiments second actuator **230** is coupled to catheter **100**. In some embodiments second actuator **230** is coupled to outer sheath **130**. In some embodiments second actuator **230** is coupled to inner sheath **140**. In some embodiments second actuator **230** is joined to catheter **100**. In some embodiments second actuator **230** is joined to outer sheath **130**. In some embodiments second actuator **230** is joined to inner sheath **140**.

In some embodiments adapter **200** comprises one stopper **240**. In some embodiments adapter **200** comprises multiple stoppers **240**. In some embodiments one stopper **240** is positioned near opening **270** of adapter **200**. In some embodiments opening **270** is an opening proximate to where catheter **100** is received by adapter **200**. In some embodiments stopper **240** is coupled to the wall of adapter **200**. In some embodiments stopper **240** is connected to the wall of adapter **200**.

In some embodiments a stopper **240** is configured to prevent second actuator **230** from moving toward drill **500**. In some embodiments a stopper **240** is configured to prevent second actuator **230** from translational motion away from drill **500**. In some embodiments stopper **240** is configured to be attached to a second actuator **230**. In some embodiments adapter **200** comprises multiple stoppers **240**.

The second actuator **230** may be attached to some portion of catheter **100** via adhesive. Or the second actuator **230** may be attached to some portion of catheter **100** via a clip. The second actuator **230** may be attached to some portion of catheter **100** via a loop. In some embodiments second actuator **230** may be attached to some portion of catheter **100** via a hook. In some embodiments second actuator **230** may be attached to some portion of catheter **100** via a detent. In some embodiments second actuator **230** may be attached to some portion of catheter **100** via a clamp. In some embodiments second actuator **230** may be attached to some portion of catheter **100** via a mechanical attachment means. In some embodiments second actuator **230** may be attached to some portion of catheter **100** via an electrical attachment means. In some embodiments stopper **240** may be configured to attach some portion of catheter **102** second actuator **230**. In some embodiments stopper **240** may be attached to second actuator **230** via a mechanical method. In some embodiments stopper **240** may be attached to second actuator **230** via a mechanism.

In some embodiments catheter **100** may be attached to adapter **200**. In some embodiments some or all of the elements of adapter **200** can be contained or housed in an adapter. Any number of elements may be contained within, be disposed on, or be surrounded by adapter **200** or some portion thereof.

In some embodiments some portion of adapter **200** may allow for visual verification or sight of at least one element contained within or partially contained within adapter **200**. In some embodiments adapter **200** may have a designated window to examine elements or an element of adapter **200**.

In some embodiments, as shown in FIGS. **6**A-C, adapter **300** comprises input shaft **310**, first actuator **320**, second actuator **330**, or third actuator **340**. In some embodiments adapter **300** comprises a torque limiter **350**. In some embodiments adapter **300** comprises a first output shaft **360**. In some embodiments adapter **300** comprises a second output shaft **370**. In some embodiments second actuator **330** comprises actuator shaft **332**, rack gear **334**, and pinion gear **336**. In some embodiments third actuator **340** comprises actuator shaft **342**, rack gear **344**, and pinion gear **346**.

In some embodiments, as shown in FIGS. **5**A, **5**B, and **6**, adapter **300** comprises input shaft **310**, first actuator **320**, second actuator **330**, or third actuator **340**. In some embodiments adapter **300** comprises a torque limiter **350**. In some embodiments adapter **300** comprises a first output shaft **360**. In some embodiments adapter **300** comprises a second output shaft **370**. In some embodiments second actuator **330** comprises actuator shaft **332**, rack gear **334**, and pinion gear **336**. In some embodiments third actuator **340** comprises actuator shaft **342**, rack gear **344**, and pinion gear **346**.

In some embodiments adapter **300** is configured such that first actuator **320** is configured to actuate third actuator **340**. In some embodiments adapter **300** is configured such that first actuator **320** is configured to actuate second actuator **330**. In some embodiments first actuator **320** is configured to actuate second actuator **330** and third actuator **340**. In some embodiments first actuator **320** is configured to actuate second actuator **330** and third actuator **340** simultaneously.

In some embodiments an input shaft **310** of adapter **300** determines which actuator the first actuator **320** will actuate. In some embodiments input shaft **310** functions as a selector lever. In some embodiments when input shaft **310** is in a first position, first actuator **320** will actuate second actuator **330**. In some embodiments when input shaft **310** is in a second position, first actuator **320** will actuate third actuator **340**. In some embodiments adapter **300** may have multiple actuators. In some embodiments first actuator **320** may be configured to actuate three or more actuators. In some embodiments first actuator **320** may be configured to actuate multiple actuators at the same time.

In some embodiments adapter **300** comprises an input shaft **310** and a first actuator **320**. In some embodiments adapter **300** comprises a second actuator **330**. In some embodiments adapter **300** comprises a third actuator **340**. In some embodiments adapter **300** comprises a torque limiter **350**. In some embodiments adapter **300** comprises a first output shaft **360**. In some embodiments adapter **300** comprises a second output shaft **370**.

In some embodiments adapter **300** is configured to actuate multiple catheters **100**. In some embodiments a first actuator **320** of adapter **300** can be configured to actuate a second actuator **330** corresponding to portion of a first catheter **100** system. In some embodiments a first actuator **320** of adapter **300** can be configured to actuate a third actuator **340** corresponding to a second catheter **100** system. In some embodiments a first actuator **320** of adapter **300** can be configured to actuate a third actuator **340** corresponding to a second portion of a first catheter **100** system.

In some embodiments the first actuator **320** may be configured to actuate one of second actuator **330** or third actuator **340**. In some embodiments first actuator **320** may be configured to actuate second actuator **330** and its corresponding first catheter **100** system as well as third actuator **340** and its corresponding second catheter **100** system. In some embodiments first actuator **320** may be configured to actuate second actuator **330** and its corresponding first portion of a first catheter **100** system as well as third actuator **340** and its corresponding second portion of a first catheter **100** system.

In some embodiments second actuator **330** may be coupled to the actuator shaft **332**. In some embodiments second actuator **330** may be coupled to actuator shaft **332** and a pinion gear **336**. In some embodiments the pinion gear **336** may contact the rack gear **334**. In some embodiments the rack gear **334** may move when pinion gear **336** is rotated by actuator shaft **332** as a result of second actuator **330** being actuated. In some embodiments the translational motion of rack gear **334** determines the translational motion of second output shaft **370**. In some embodiments second output shaft **370** is coupled to catheter **100**. In some embodiments second output shaft **370** is coupled to inner sheath **140** of catheter **100**. In some embodiments second output shaft **370** is coupled to outer sheath **130** of catheter **100**.

In some embodiments third actuator **340** may be coupled to the actuator shaft **342**. In some embodiments third actuator **340** may be coupled to actuator shaft **342** and a pinion gear **346**. In some embodiments the pinion gear **346** may contact the rack gear **344**. In some embodiments the rack gear **344** may move when pinion gear **346** is rotated by actuator shaft **342** as a result of third actuator **340** being actuated. In some embodiments the translational motion of rack gear **344** determines the translational motion of first output shaft **360**. In some embodiments first output shaft **360** is coupled to catheter **100**. In some embodiments first output shaft **360** is coupled to inner sheath **140** of catheter **100**. In some embodiments second output shaft **370** is coupled to outer sheath **130** of catheter **100**.

In some embodiments second output shaft **370** may be concentric to first output shaft **360**, as shown in FIG. **6**A. In some embodiments second output shaft **370** may be adjacent to first output shaft **360**. In some embodiments second output shaft **370** may be proximate to first output shaft **360**. In some embodiments adapter **300** may comprise a torque limiter **350**.

In some embodiments second output shaft **370** may be concentric to first output shaft **360**, as shown in FIG. **6**. In some embodiments second output shaft **370** may be adjacent to first output shaft **360**. In some embodiments second output shaft **370** may be proximate to first output shaft **36***a*. In some embodiments adapter **300** may comprise a torque limiter **350**.

In some embodiments some or all of the elements of adapter **300** can be contained or housed in an adapter. Any number of elements may be contained within, be disposed on, or be surrounded by adapter **300** or some portion thereof.

In some embodiments some portion of adapter **300** may allow for visual verification or sight of at least one element contained within or partially contained within adapter **300**. In some embodiments adapter **300** may have a designated window to examine elements or an element of adapter **300**.

In some embodiments first actuator **320** comprises a gear. In some embodiments first actuator **320** may provide a link to other actuators. In some embodiments input shaft **310** actuates first actuator **320**. In some embodiments first actuator **320** actuates a second actuator **330**. In some embodiments first actuator **320** actuates a third actuator **340**.

In some embodiments adapter **300** is configured to have a movable first actuator **320**. In some embodiments first actuator **320** is configured to contact or align with second actuator **330**. In some embodiments first actuator **320** is configured to contact or align with third actuator **340**. In some embodiments first actuator **320** is coupled to the input shaft **310**. In some embodiments input shaft **310** and first actuator **320** are configured to move such that first actuator **320** will contact second actuator **330**. In some embodiments input shaft **310** and first actuator **320** are configured to move such that first actuator **320** will contact third actuator **340**.

In some embodiments input shaft **310** will actuate first actuator **320** which will then actuate second actuator **330**. In some embodiments input shaft **310** will actuate first actuator **320** which will then actuate third actuator **340**. In some embodiments moving the first actuator can be performed via a selector lever. In some embodiments the input shaft **310** may be a selector lever. In some embodiments the selector lever may be a separate element.

In some embodiments adapter **300** may be configured to permit movement of first actuator **320** via a mechanical lever. In some embodiments adapter **300** may be configured to permit movement of first actuator **320** via an electrical actuator. In some embodiments the first actuator **320** is configured to be moved manually. In some embodiments the first actuator **320** is configured to be moved automatically.

In some embodiments, as shown in FIGS. **7**-**8**, adapter **700** is configured to compress or crimp an article. In some embodiments adapter **700** comprises an input shaft **710**, a first actuator **720**, a compressor **730**, or a compression chamber **740**. In some embodiments adapter **700** comprises lumen **750**. In some embodiments adapter **700** comprises door **760**. In some embodiments adapter **700** may not comprise door **760** but may instead only have an opening.

In some embodiments adapter **700** comprises an input shaft **710**, a first actuator **720**, a compressor **730**, and a compression chamber **740**. In some embodiments first actuator **720** is configured to be actuated by a motor. In some embodiments a motor comprises a motorized device **600**. In some embodiments a motor comprises a drill **500**. In some embodiments compression chamber **740** is a channel. In some embodiments compression chamber **740** is a slot. In some embodiments compression chamber **740** is configured to receive a prosthetic heart valve **400**. In some embodiments compression chamber **740** is configured to receive an article.

In some embodiments compression chamber **740** is configured to compress or crimp a portion of a prosthetic heart valve **400** via the compressor **730**. The compressor **730** may be a second actuator of adapter **700**. The compressor **730** may comprise a spring. In some embodiments compressor **730** comprises an arm. The compressor **730** may comprise a lever. In some embodiments compressor **730** comprises multiple arms. In some embodiments compressor **730** comprises multiple springs. In some embodiments prosthetic heart valve **400** is a transcatheter heart valve. In some embodiments prosthetic heart valve **400** is a self-expandable heart valve. In some embodiments prosthetic heart valve **400** is a balloon-expandable heart valve. In some embodiments prosthetic heart valve **400** is a mechanically-expandable heart valve.

The compression chamber **740** may be configured to receive elements of a prosthetic heart valve **400**. In some embodiments compression chamber **740** is configured to receive a valve assembly. The compression chamber **740** may be configured to receive a valve frame. In some embodiments compression chamber **740** is configured to couple, join, or attach a valve assembly to a valve frame together.

In some embodiments adapter **700** comprises a detachable portion. In some embodiments a detachable portion includes a handle. In some embodiments compression chamber **740** is configured to compress an article into a shape. For example compression chamber **740** may be configured to compress an article into a cylinder.

In some embodiments compression chamber is configured to compress an article via the compressor **730**. In some embodiments compression chamber **740** is configured to compress an article via a second actuator. In some embodiments the compressed article is configured to be disposed on a catheter **100** after being compressed. In some embodiments the compressed article is disposed on a catheter **100** after being compressed.

Adapter **700** may be configured to compress a portion of an article. In some embodiments adapter **700** is configured to compress a prosthetic heart valve **400**. In some embodiments the article may comprise a heart valve. The adapter **700** may comprise an input shaft **710**. The adapter **700** may comprise a first actuator **720**. In some embodiments adapter **700** may comprise a compressor **730**. In some embodiments compressor **730** may be an actuator. In some embodiments adapter **700** may comprise a compression chamber **740**. In some embodiments adapter **700** may comprise a lumen **750**. In some embodiments adapter **700** may comprise a door **760**.

In some embodiments input shaft **710** is configured to rotate. In some embodiments input shaft **710** is configured to be rotated via a drill **500**. In some embodiments input shaft **710** is configured to be rotated via a motorized device **600**. In some embodiments input shaft **710** actuates a first actuator **720**. In some embodiments a first actuator **720** actuates compressor **730**. In some embodiments a first actuator **720** actuates compressors **730**. In some embodiments compressor **730** at least partially compresses a portion of an article or a prosthetic heart valve **400**. In some embodiments compressor **730** is configured to compress multiple portions of an article or prosthetic heart valve **400**.

In some embodiments compressor **730** is configured to collapse prosthetic heart valve **400** to a collapsed state. In some embodiments compression chamber **740** is configured to receive an article. In some embodiments compression chamber **740** is configured to receive a prosthetic heart valve **400**.

In some embodiments compressor **730** comprises a spring. In some embodiments compressor **730** comprises multiple springs. In some embodiments compressor **730** comprises multiple springs of varying strength. In some embodiments compressor **730** is rotated such that at least a portion of a prosthetic heart valve **400** is compressed. In some embodiments, as shown in FIGS. **7-8**, adapter **700** is configured to receive a catheter assembly **800**. In some embodiments adapter **700** is configured to receive catheter **100**. In some embodiments catheter assembly **800** comprises a handle **810**.

In some embodiments adapter **700** is configured to receive catheter assembly **800**. In some embodiments adapter **700** is configured such that catheter assembly **800** can pass through adapter **700**. In some embodiments adapter **700** is configured such that catheter **100** can pass through adapter **700**. In some embodiments adapter **700** is configured to compress a prosthetic heart valve **400** such that the prosthetic heart valve is disposed on a catheter **100** or catheter assembly **800** after it is compressed or crimped. In some embodiments catheter assembly **800** is configured to detach from adapter **700**. In some embodiments catheter assembly **800** is configured to attach to adapter **700**. In some embodiments catheter assembly **800** is configured to releasably attach to adapter **700**.

In some embodiments adapter **700** is modular. In some embodiments adapter **700** includes catheter assembly **800**. In some embodiments adapter **700** is modular such that certain elements may be detached from or attached to adapter **700**. In some embodiments adapter **700** includes catheter **100**. In some embodiment adapter **700** is modular such that certain elements may be detached from or attached to adapter **700**.

The adapter **700** may comprise a door **760**. In some embodiments door **760** may open such that prosthetic heart valve **400** may be loaded into compression chamber **740** through door **760**. In some embodiments compressor **730** may comprise an arm. In some embodiments compressor **730** may comprise arms. In some embodiments compressor **730** may compress at least a portion of a prosthetic heart valve **400** loaded into compression chamber **740**. In some embodiments compressors **730** may compress multiple portions of prosthetic heart valve **400**. In some embodiments prosthetic heart valve **400** may be compressed into a cylinder. In some embodiments first actuator **720** is configured to actuate compressor **730** or compressors **730** such that an article or a prosthetic heart valve **400** is at least partially compressed.

The adapter **700** may be contained in a portion of a catheter assembly **800**. In some embodiments the adapter **700** is contained in a portion of a handle **810**. In some embodiments adapter **700** is configured such that a portion of catheter assembly **800** can pass through adapter **700**. In some embodiments the catheter assembly **800** may be present in adapter **700** while the compressor **730** compresses a portion of a prosthetic heart valve **400**. In some embodiments a prosthetic heart valve **400** may be disposed on a catheter assembly **800** after compressor **730** compresses a portion of prosthetic heart valve **400**.

In some embodiments a motorized device **600** may comprise a modular motor section. In some embodiments a motorized device **600** may comprise a detachable modular motor section. In some embodiments a motorized device **600** may comprise a modular motor section that can be attached to a section of handle **810**. In some embodiments a motorized device **600** may comprise a reusable modular motor section.

The adapter **700** may be configured to permit advancing prosthetic heart valve **400** out of adapter **700**, while the adapter **700** is at least partially compressed. In some embodiments adapter **700** is configured to permit advancing prosthetic heart valve **400** via a portion of catheter assembly **800**. In some embodiments adapter **700** is configured to permit advancing prosthetic heart valve **400** via a portion of catheter **100**.

In some embodiments the door **760** may be configured to compress a portion of a prosthetic heart valve **400** disposed inside the compression chamber **730**. In some embodiments adapter **700** may be configured such that such that when the door **760** is closed a portion of prosthetic heart valve **400** is compressed. In some embodiments the door **760** may be configured to compress the entire prosthetic heart valve **400** disposed inside the compression chamber **730**. In some embodiments adapter **700** may be configured such that such that when the door **760** is closed the entire prosthetic heart valve **400** is compressed.

The foregoing description has been presented for purposes of illustration and description. Any structure, elements, or portions described can be contained in or part of a single or multiple structures. It is not intended to be exhaustive or to limit the precise embodiments disclosed. Other modifications and variations may be possible in light of the above teachings. The embodiments and examples were chosen and described in order to best explain the principles of the embodiments and their practical application, and to thereby enable others skilled in the art to best utilize the various embodiments with modifications as are suited to the particular use contemplated. By applying knowledge within the skill of the art, others can readily modify and/or adapt for various applications such specific embodiments, without undue experimentation, without departing from the general concept. Therefore, such adaptations and modifications are intended to be within the meaning and range of equivalents of the disclosed embodiments, based on the teaching and guidance presented herein.

What is claimed is:

1. An apparatus for actuating a delivery system, the apparatus comprising:

an input shaft having a proximal portion and a distal portion, the proximal portion of the input shaft configured to be rotated by a motorized device;

a first actuator coupled to the distal portion of the input shaft, wherein the first actuator is configured to rotate upon rotation of the input shaft;

a second actuator coupled to the first actuator and configured to be coupled to a first catheter-based delivery system such that the first catheter-based delivery system is distal of the distal portion of the input shaft,

wherein the first actuator is configured to actuate the second actuator such that a rotation of the first actuator causes a translational motion of the second actuator, and wherein the translational motion of the second actuator is configured to actuate a first portion of the first catheter-based delivery system;

a third actuator configured to be coupled to the first catheter-based delivery system; and

a selector,

wherein the first actuator is configured to actuate the third actuator such that a second portion of the first catheter-based delivery system is actuated,

wherein the first actuator is configured to actuate the second actuator and the third actuator, and wherein when the selector is actuated the first actuator actuates one of the second actuator and the third actuator.

2. The apparatus of claim **1**, wherein the motorized device is a motorized drill.

3. The apparatus of claim **1**, wherein the apparatus is configured to limit the amount of translational motion of the second actuator by a limit switch.

4. The apparatus of claim **1**, the apparatus further comprising a first catheter-based delivery system comprising

a distal tip; and

a capsule adjacent the tip;

wherein the translational motion of the second actuator corresponds to translational motion of the capsule of the first catheter-based delivery system.

5. The apparatus of claim **1**, wherein the apparatus further comprises a torque limiter, wherein the torque limiter is configured to limit an output torque of the apparatus.

6. The apparatus of claim **5**, wherein the apparatus further comprises a gear box.

7. The apparatus of claim **1**, the apparatus further comprising a first catheter-based delivery system comprising

an inner sheath having a proximal end coupled to the second actuator,

wherein the translational motion of the second actuator corresponds to translational motion of the inner sheath of the first catheter-based delivery system.

8. The apparatus of claim **7**, wherein the first catheter-based delivery system further comprises an outer sheath surrounding the inner sheath, wherein the inner sheath is slidable relative to the outer sheath.

9. The apparatus of claim **1**, the apparatus further comprising a first catheter-based delivery system comprising,

a distal tip;

an inner sheath having an inner sheath proximal end;

an outer sheath having an outer sheath distal end and an outer sheath proximal end,

wherein the first portion of the first catheter-based delivery system is the outer sheath such that the second actuator is coupled to the outer sheath proximal end,

wherein the second portion of the first catheter-based delivery system is the inner sheath such that the third actuator is coupled to the inner sheath proximal end.

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